

Claims

1  
2 1. Method of manufacturing pistons and components  
3 thereof, piston heads for example, especially intended for  
4 internal-combustion engines, wherein in an initial  
5 manufacturing step (A) a blank (1) that will eventually  
6 constitute the piston or piston component is preliminarily  
7 forged along a prescribed axis (1'), shaping appropriate  
8 contours (2, 3, 4, 5, 6), and wherein in at least one  
9 subsequent manufacturing step (B) the preliminarily shaped  
10 piston (7) is finally forged along at least one other axis  
11 (1'') , creating additional contours (6).  
12

13 2. Method as in Claim 1, characterized in that the  
14 initial manufacturing step (A) comprises preliminarily  
15 shaping the blank (1) along an axis (1') that constitutes its  
16 longitudinal axis.  
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18 3. Method as in Claim 1 ~~or 2~~, characterized in that in  
19 the initial manufacturing step (A) a rod-like and optionally  
20 cylindrical blank (1) is upset and provided with a skirt (22)  
21 and a cavity (2), whereby contours (3-6) are shaped onto the  
22 skirt (22) along its longitudinal axis (1') in the vicinities  
23 of its inner and outer circumferences (3) and of its upper  
24 and lower faces (4).  
25

1 4. Method as in <sup>claim</sup> ~~one of Claims 1 through 3~~, characterized  
2 in that in the subsequent manufacturing step (B) further  
3 contours (6) are shaped onto the preliminarily shaped piston  
4 (7) along another axis (1'') by forging at approximately 90°  
5 to the first axis (1'), especially the longitudinal axis.

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7 5. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 4~~, characterized  
8 in that initial manufacturing step (A) along the first axis  
9 and the subsequent manufacturing step (B) along the second  
10 axis are carried out in the same forging tool (10), into  
11 which the blank (1) can be optionally heated before it is  
12 inserted.

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14 6. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 5~~, characterized  
15 in that during the subsequent manufacturing step (B) the wall  
16 thickness of the preliminarily shaped piston (7) can be  
17 decreased, accompanied by the creation of reinforcements  
18 (23).

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20 7. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 6~~, characterized  
21 in that during one of the manufacturing steps (A & B) an  
22 integrated skirt (22) can be shaped onto the preliminarily  
23 shaped piston (7) such that the skirt will be accommodated  
24 within the skirt's [sic] circumference (21) during the  
25 subsequent manufacturing step (B).

1 8. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 7~~, characterized  
2 in that a steel blank (1) is employed.

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4 9. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 8~~, characterized  
5 in that the piston (7) can optionally be reformed within  
6 another plane in still another manufacturing step.

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8 10. Method as in <sup>claim 1</sup> ~~one of Claims 1 through 9~~,  
9 characterized in that, especially in the manufacture of  
10 piston heads (7), excess material (8) is removed and/or  
11 recesses (9) created, especially by punching, during at least  
12 one of the manufacturing steps (A & B).

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14 11. Forging tool with in the vicinity of an upper die  
15 half (11) and of a lower die half (12) several parts (13, 14,  
16 15, 16, & 17) that can be displaced toward a blank (1) over  
17 planes defined by axes (1' & 1''), preliminarily and finally  
18 shaping a piston or a component thereof, a piston head for  
19 example, whereby the parts in at least one of the die halves  
20 (11 or 12) can be employed for the preliminary forging and  
21 the parts (16) in at least one lower die half (12) can be  
22 employed for the final forging.

23  
24 12. Forging tool as in Claim 11, characterized in that  
25 the parts (13-15) in the upper die half (11) can be employed

1 for the preliminary forging and the parts (16 & 17) in the  
2 lower die half (12) can be employed for the final forging.

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4 13. Forging tool as in <sup>claim 11</sup> ~~one of Claims 11 and 12~~,  
5 characterized in that the parts (16 & 17) in the lower die  
6 half (12) can be rotated into a position approximately 90 °  
7 to the direction traveled by the parts (13-15) in the upper  
8 die half (11).

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10 14. Forging tool as in <sup>claim 11</sup> ~~one of Claims 11 through 13~~,  
11 characterized in that the parts (16) in the lower die half  
12 (12) can be rotated especially by hydraulic piston-and-  
13 cylinder mechanisms (18) into a position at an angle to the  
14 parts (13-15) in the upper die half (11).

15

16 15. Forging tool as in <sup>claim 11</sup> ~~one of Claims 11 through 14~~,  
17 characterized in that individual parts (13 & 16) in the upper  
18 die half (11) and in the lower die half (12) can slide over  
19 surfaces the extend over various planes in the vicinity of  
20 the lower die half (12).

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add B<sup>S</sup> 7